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RELATION BETWEEN THE COMPOSITION OF CALIFORNIA CANTALOUPES AND THEIR COMMERCIAL MATURITY.

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CONTENTS.

	Page.		Page.
California cantaloupe industry	1	Discussion of results	4
Purpose of investigation	2	Practical application of results	25
Investigational work	2	Summary	26

CALIFORNIA CANTALOUPE INDUSTRY.

The cantaloupe industry of California has been created within the past 10 years, during which period the yearly shipments have increased from a few hundred to 15,000 cars. The growth of the industry is shown in Table 1, which gives car-lot shipments from the large melon-growing counties of the State from 1916 to 1923. The miscellaneous sections include San Joaquin, Tulare, and Kern counties.

Table 1.—*Car-lot shipments of cantaloupes from California.*

District.	1916	1917	1918	1919	1920	1921	1922	1923
Imperial Valley	4,622	5,744	4,405	7,799	9,015	10,682	12,236	12,992
Stanislaus County	3,467	2,514	2,443	3,897	3,849	2,089	2,306	1,836
Miscellaneous sections						436	930	621

Placing California melons in eastern markets in a satisfactory condition presents many difficulties, not the least of which is the determination of the proper stage of maturity for picking. California is from 1,800 to 3,000 miles from eastern distributing points and the time of transit between the two points has varied from 10 to 20 days. With the usual methods of handling, if melons have been allowed to develop too far before being picked, they can be shipped only short distances. Such melons, known to the trade as choice, are sold in California cities. For eastern shipment, it is customary to pick the

[1] N. C. Smith and J. B. McNair collaborated in the analytical work, and E. L. Markell, G. L. Fischer, and A. E. Nelson in the field work.

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melons before any trace of yellow color has developed and while the rind is hard. Naturally this has resulted in picking melons which are too green, so that often consumers buy them with flesh that is shriveled and tough, lacking in color and odor, and disappointing in flavor.

Both the grower and the packer are interested in preventing the shipment of immature melons, since "the shipping of green melons is probably the quickest way in which to ruin the demand in all markets."[2]

PURPOSE OF INVESTIGATION.

The purpose of the investigation here reported was to devise suitable tests by which the stage of development of cantaloupes can be judged and by means of which growers and packers may be sure that mature melons are selected and immature ones left on the vine. Information as to the changes that take place in the composition of melons after being picked also seemed desirable, in order to determine whether their composition at the time they are sold to the consumer is an indication of their condition at the time of picking.

It seemed necessary, therefore, to study the composition of melons at different stages of their maturity to ascertain, if possible, what relation exists between the eating quality of the fruit and its composition and to determine to what extent the external appearance can be correlated with the internal condition. From these relations a limit below which melons could be regarded as unsuitable for marketing might be fixed.

INVESTIGATIONAL WORK.

PLAN OF EXPERIMENTS AND METHODS USED.

Place.—The principal experiments were conducted at Brawley and Turlock in 1916, at Brawley in 1917, and at Brawley, Porterville, and Turlock in 1920 and 1921. A little work was also done in Brawley in 1918 and 1919, and in Turlock in 1918. In addition, cantaloupes were planted in special plots at Garden Grove, in 1917, and at Altadena, in 1919, and the growth of individual melons was followed closely from the blooming period to maturity. The rapidity of the growth of the melons is shown in Figures 1 and 2. About four weeks elapse between the time the melon sets and its maturity.

Variety.—The only variety of netted melon commercially important at present in the districts mentioned is the Pollock No. 25 or Salmon Tint. Some data were obtained on Eden Gems and Early Waters in 1916 (Table 13), but commercial plantings of these varieties ceased after that year and the experiments with them were discontinued.

Sampling.—Samples were obtained for analysis by different methods, depending on the purpose for which selections were made. Some of the melons were picked from the vines by the investigators; some were selected by collaborators in the Bureau of Agricultural Economics of the United States Department of Agriculture; and others, picked by commercial pickers, were taken by the investigators from field boxes or packing bins. Frequent examinations of commercially packed melons ready for shipment have also been

[2] O. W. Schleussner and C. W. Kitchen. Marketing and Distribution of Western Muskmelons in 1915. U. S. Dept. Agr. Bul. 401 (1916), p. 13.

made. Generally six melons were included in a sample, although in 1920 much of the work consisted in analyzing and making notes on individual melons.

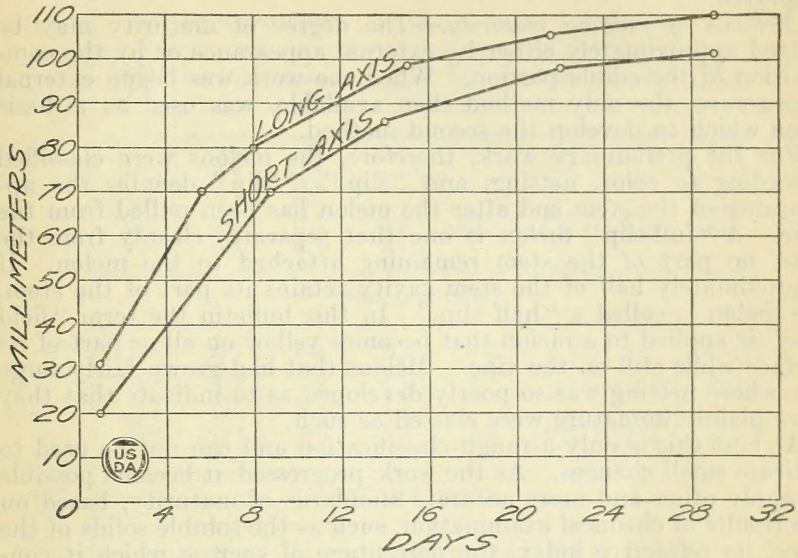

FIG. 1.—Average length of long and short axes of 18 cantaloupes grown at Garden Grove in 1917.

Methods of analysis.—The edible part of the melon was scooped out with a spoon and ground in a food chopper, and the juice was strained through a coarse cotton cloth. The specific gravity of the juice was measured either with a Brix spindle or with a spindle reading directly

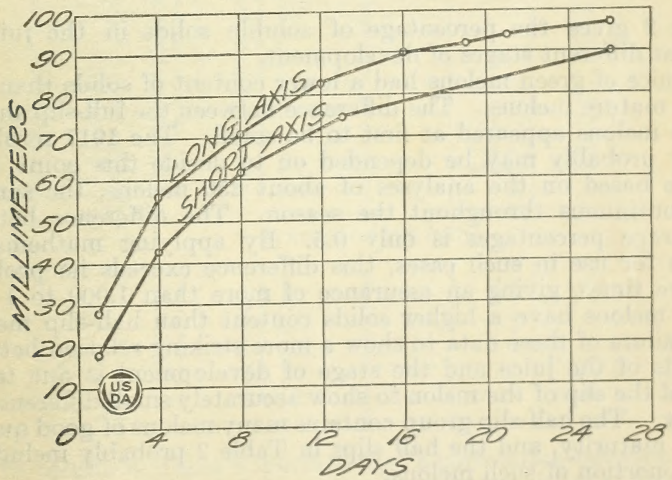

FIG. 2.—Average length of long and short axes of 29 cantaloupes grown at Altadena in 1919.

in specific gravity and corrections were made for temperature. For the refractive index of the juice, a Zeiss immersion refractometer was used, all readings being made at 20°C. For total sugar and sucrose,

copper reduction methods were used,[3] except in 1920, when sucrose was estimated by polarization before and after inversion. Because of the small quantity of starch in the seeds, a new method was employed.[4]

Methods of judging maturity.—The degree of maturity may be judged approximately either by external appearance or by the composition of the edible portion. When the work was begun external appearance, the only method then available, was used as a basis upon which to develop the second method.

For the preliminary work, therefore, the melons were classified according to color, netting, and "slip." "Slip" denotes the appearance of the stem end after the melon has been pulled from the vine. A "full-slip" melon is one that separates cleanly from the vine, no part of the stem remaining attached to the melon. If approximately half of the stem cavity retains its part of the stem, the melon is called a "half slip." In this bulletin the term "field ripe" is applied to a melon that becomes yellow on all or part of its surface while still on the vine. Melons that had grown fairly large but whose netting was so poorly developed as to indicate that they were plainly immature were classed as such.

At best this is only a rough classification and can not be used to indicate small changes. As the work progressed it became possible to apply other and more accurate standards of maturity, based on the results of chemical examination, such as the soluble solids of the juice, its refractive index, the percentage of sucrose which it contained, or the starch content of the seeds.

DISCUSSION OF RESULTS.

CHEMICAL COMPOSITION AS AN INDICATION OF MATURITY.

SOLUBLE SOLIDS IN JUICE.

Table 2 gives the percentage of soluble solids in the juice of melons at different stages of development.

The juice of green melons had a lower content of solids than that of more mature melons. The difference between the full-slip and the half-slip melons appeared at first to be small. The 1917 results at Brawley probably may be depended on to decide this point, since they are based on the analyses of about 250 melons, the samples being continuous throughout the season. The difference between the average percentages is only 0.5. By applying mathematical methods for use in such cases, this difference exceeds its probable error five times, giving an assurance of more than 1,000 to 1 that full-slip melons have a higher solids content than half-slip melons.

The failure of these data to show a more striking relation between the solids of the juice and the stage of development is due to the failure of the slip of the melon to show accurately small differences in maturity. The half-slip group contains many melons of good quality and full maturity, and the half slips in Table 2 probably included a large proportion of such melons.

[3] Association of Official Agricultural Chemists, Official Methods of Analysis, 1916, pp. 87, 97, 109.
[4] Journal of the Association of Official Agricultural Chemists (1922), *6*: 175–191.

TABLE 2.—*Solids in juice as an indication of maturity.*

BRAWLEY (1916).

Stage of development.				Stage of development.			
Field ripe.	Full slip.	Half slip.	Immature.	Field ripe.	Full slip.	Half slip.	Immature.
Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
	12.8	12.6	12.4	11.5	12.6	11.9	11.2
12.6	14.0	11.9			12.4		
	13.5	12.6		11.7	13.3	12.8	
14.0	13.1	12.1					
12.4	13.5	12.6		**12.6**	**13.1**	**12.4**	**10.7**
12.9	13.1	11.9	9.8	**±0.19**	**±0.10**	**±0.09**	**±0.55**
12.6	12.9	12.4	9.3				
TURLOCK (1916).							
13.1	12.1	12.4	7.1	10.7	11.4	11.7	9.7
10.0	12.1	11.2	10.5	12.4	11.2	10.7	8.8
12.1	12.8	11.4	10.7	10.7	11.4	12.6	10.0
10.9	12.1	12.4	8.3	10.7	10.5	10.2	8.5
13.1	13.1	13.5	11.4				
11.9	11.9	12.6	9.5	**11.6**	**11.9**	**11.9**	**9.5**
11.7	13.3	12.8	9.5	**±0.23**	**±0.17**	**±0.22**	**±0.25**
BRAWLEY (1917).							
	13.1	12.6			14.9	13.8	
	13.3	13.5			14.9	14.2	
	13.5	13.8			14.2	14.2	
	13.5	13.3			13.8	14.5	
	13.5	12.8			14.7	13.3	
	14.0	13.5			13.1	13.8	
	13.1	13.1			14.2	14.0	
	14.5	12.8			12.9	13.8	
	13.5	13.1			13.1	12.4	
	13.8	13.5			13.3	13.1	
	13.1	13.8			13.3	13.8	
	13.5	12.8				13.1	
	14.9	13.5				13.3	
	14.2	14.0				12.8	
	14.0	12.4				12.8	
	14.7	14.2				12.6	
	13.5	13.5				13.1	
	13.3	13.3				13.1	
	13.5	13.3				13.3	
	13.8	13.8				12.6	
	13.1	13.5					
	13.3	13.3			**13.8**	**13.3**	
	13.8	13.3			**±0.07**	**±0.05**	
	14.2	13.3					
GARDEN GROVE (1917).							
	12.4	9.7			12.8	12.6	
	11.4	10.7			12.1		
	11.7	11.4			12.4		
	12.1	9.3			11.9		
	11.7	11.7			12.8		
	12.1	9.3					
	11.7	9.3			**11.9**	**10.7**	
	10.9	12.4			**±0.10**	**±0.35**	

The results in Table 8 indicate that a correlation between the soluble solids of the juice and the maturity, as judged by the eating quality of the melon, exists. The solids content of the juice of good melons was decidedly greater than that of the juice of less desirable melons.

A test based on solids or specific gravity has the advantage of being practicable for field operations, as it is easily made and does

not require expensive apparatus. A Brix spindle reading, which gives the soluble solids, can be used as a measure of quality and maturity in cantaloupes, and suitable limits are suggested on page 15.

SUCROSE IN JUICE.

Since sweetness of juice is a desirable characteristic in melons, measurements of the percentage of sucrose as growth advanced were made. The results obtained in 1916 and 1917 are shown in Table 3

TABLE 3.—*Sucrose in juice as an indication of maturity.*

BRAWLEY (1916).

Stage of development.				Stage of development.			
Field ripe.	Full slip.	Half slip.	Immature.	Field ripe.	Full slip.	Half slip.	Immature.
Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
6.36	7.28	3.65	----------	6.75	5.59	6.07	2.68
----------	6.23	5.50	4.78	5.84	6.74	5.89	4.86
----------	7.32	6.04	----------	----------	6.32	----------	----------
7.43	6.22	5.37	----------	5.81	6.91	6.56	----------
6.03	6.98	5.46	----------	----------	----------	----------	----------
6.55	6.52	4.94	3.04	**6.40**	**6.61**	**5.50**	**3.84**

TURLOCK (1916).

2.96	4.82	4.17	3.40	4.69	5.21	5.16	3.12
6.22	5.80	5.22	1.21	4.72	5.15	5.79	2.68
5.16	6.21	4.83	4.01	5.18	4.23	3.66	1.94
4.02	5.60	5.63	1.47	3.87	3.77	3.02	1.64
6.37	6.47	7.20	4.47				
5.59	5.51	5.79	2.48	**4.94**	**5.35**	**5.10**	**2.64**
5.61	6.03	5.59	2.57				

BRAWLEY (1917).

----------	5.84	5.37	----------	----------	7.61	7.32	----------
----------	6.40	5.57	----------	----------	8.00	6.75	----------
----------	6.75	6.57	----------	----------	7.26	7.13	----------
----------	6.49	6.24	----------	----------	6.73	5.63	----------
----------	6.70	6.41	----------	----------	7.08	6.32	----------
----------	8.06	6.74	----------	----------	6.39	6.72	----------
----------	7.16	6.30	----------	----------	7.77	6.75	----------
----------	8.23	5.94	----------	----------	6.11	6.87	----------
----------	6.58	5.70	----------	----------	6.07	5.80	----------
----------	6.23	6.39	----------	----------	6.40	6.50	----------
----------	5.71	6.15	----------	----------	7.09	6.77	----------
----------	6.06	5.98	----------	----------	----------	6.41	----------
----------	6.18	6.34	----------	----------	----------	6.54	----------
----------	6.41	5.74	----------	----------	----------	6.00	----------
----------	5.97	5.70	----------	----------	----------	5.86	----------
----------	6.99	6.79	----------	----------	----------	5.83	----------
----------	5.23	6.22	----------	----------	----------	6.03	----------
----------	6.68	6.43	----------				
----------	7.09	6.06	----------	----------	----------	5.79	----------
----------	7.14	7.16	----------	----------	----------	6.48	----------
----------	6.45	7.03	----------	----------	----------	5.81	----------
----------	5.56	6.82	----------				
----------	7.23	6.02	----------	----------	6.72	**6.31**	----------
----------	7.50	6.52	----------	----------	±0.684	±0.050	----------

Immature melons had much less sucrose than riper melons. Although not great, the difference between the full-slip and half-slip melons is significant. In this case the odds are more than 200 to 1 that full-slip melons contain more sucrose than half slips.

A more striking correlation between the sucrose content and maturity as judged by eating quality is shown in Table 8, indicating that the percentage of sucrose in the juice of the melon is a measure of its maturity.

From a practical standpoint, it would not be desirable to use the sucrose content as a basis for judging the degree of development because of the inconvenience of making this determination. The estimation of sucrose by the copper reduction method requires a specially trained worker and the saccharimetric method calls for expensive apparatus.

REFRACTIVE INDEX OF JUICE.

That a definite correlation exists between maturity and the refractive index of juice is shown in Table 4. The melons analyzed, collected in the fields at Brawley, were carefully selected to represent the class in which they were placed. Each melon was analyzed individually, which allowed an opportunity not only of correlating the refractive index with the stage of maturity, but also of noting the variability of each class.

Additional evidence of the close relationship between the refractive index and maturity, judged by the eating quality, is given in Table 8, in which large differences between the indexes of mature and of immature melons are shown.

TABLE 4.—*Refractive index of juice as an indication of maturity (Brawley, 1920).*

Melon No.	Stage of development							
	Field ripe.		Full slip.		Half slip.		Immature.	
	Refractive index.	Starch in seeds.[1]	Refractive index.	Starch in seeds.[1]	Refractive index.	Starch in seeds.[1]	Refractive index.	Starch in seeds.[1]
1	52.2	P	63.3	A	61.0	A	----------	----------
2	62.5	A	64.0	A	48.0	PPPP	35.1	PPPPP
3	56.6	----------	55.8	P	55.2	P	44.2	----------
4	58.1	A	59.0	A	58.0	A	54.1	PP
5	53.1	P	51.5	PP	56.3	T	39.0	----------
6	60.0	A	56.1	PPP	57.0	T	42.4	PPPPP
7	57.5	----------	57.1	A	53.8	P	56.4	T
8	58.9	A	57.4	A	54.2	T	50.4	PPP
9	55.9	P	62.5	A	47.5	----------	37.0	----------
10	52.6	T	52.1	P	47.1	PP	41.3	----------
11	52.0	P	55.0	A	54.5	P	30.3	PP
12	60.2	P	57.3	A	54.5	P	46.0	----------
13	62.7	A	65.3	A	50.0	T	52.3	P
14	64.2	A	61.3	A	55.2	P	53.1	PP
15	55.3	P	64.7	A	46.2	T	40.8	PP
16	62.3	A	59.3	A	47.6	PP	40.5	PPP
17	63.0	----------	63.3	A	57.2	T	36.2	----------
18	49.1	PPP	58.4	PP	57.8	A	52.4	P
19	49.5	A	58.2	A	54.0	----------	38.2	----------
20	51.2	A	58.1	A	60.2	A	44.2	----------
21	55.6	A	55.8	A	58.0	----------	37.2	----------
22	49.2	P	56.5	A	50.4	P	41.4	----------
23	59.8	----------	----------	----------	51.3	P	35.7	PPPP
24	51.1	----------	51.3	A	53.7	A	41.0	----------
25	49.8	A	61.5	A	56.2	A	46.3	PP
26	54.0	----------	58.5	----------	53.2	----------	38.6	----------
27	53.0	T	55.8	----------	54.0	P	36.6	----------
Average	**55.9** ±0.67	----------	**58.4** ±0.52	----------	**53.8** ±0.52	----------	**42.7** ±0.94	----------

[1] A, starch absent; T, trace of starch; P, starch present

That half-slip melons are extremely variable is shown in column 6, Table 4, where the indexes vary from 47 to 61. When these melons were analyzed the half slips with high indexes were well flavored, while those with low indexes were of doubtful or unsatisfactory quality. The half-slip group, then, contains both mature and immature melons. A fairly satisfactory commercial separation of the half-slip group can be made on external appearance alone (Table 10).

Objection may be made to the use of the refractive index as an indication of maturity from the fact that Table 4 shows that field-ripe melons have a lower index than full-slip melons. Additional evidence in Tables 2 and 3 proves that field-ripe melons have a lower sucrose content, specific gravity, and refractive index than full slips. The reason for this may be twofold. First, after reaching maturity, the fruit automatically starts to detach itself from the vine, and food materials, the further supply of which is restricted, especially the sugars, are used up in the rapid respiration that takes place at the high field temperature. Second, for reasons not understood, the normal development of the fruit may be interrupted and a yellow color prematurely attained (field-ripe melon 18, Table 4).

Melons that become yellow in the field are often of unsatisfactory quality, and they are never selected when melons of dependable edibility are desired.

Great confidence may be placed in the correlation between refractive index and development. An immersion refractometer furnishes the most satisfactory means of placing a numerical value upon the extent to which melons have developed. The determination can be quickly made on small quantities of juice and small differences can be accurately measured.

STARCH IN SEEDS.

Soon after the analytical work was begun it was noted that extracts of seeds from immature melons gave a strong blue color when tested for starch by the iodine method, while those of seeds from mature melons contained no starch or only traces of it. The results of the starch tests in 1916 and 1917 are shown in Table 5.

TABLE 5.—*Starch in seeds as an indication of maturity.*

BRAWLEY (1916) (MELONS NOT STORED).

Stage of development.[1]				Stage of development.[1]			
Field ripe.	Full slip.	Half slip.	Immature.	Field ripe.	Full slip.	Half slip.	Immature.
----------	A	P	A	A	A	P	PPP
A	A	P	----------	A	T	P	PPP
----------	A	----------	----------	T	T	P	PPP
----------	----------	T	----------	A	A	P	P
A	A	PPP	----------	A	A	T	----------
A	A	PP	----------	----------	T	----------	----------

[1] A, starch absent; T, trace of starch; P, starch present.

TABLE 5.—*Starch in seeds as an indication of maturity*—Continued.

BRAWLEY (1916) (MELONS STORED).

Stage of development.[1]				Stage of development.[1]			
Field ripe.	Full slip.	Half slip.	Immature.	Field ripe.	Full slip.	Half slip.	Immature.
A	A	T			A	PPP	
A	A	T			A	PPP	
	T	P			T	T	
	A	P			A		
	A	P			A		
TURLOCK (1916) (MELONS NOT STORED).							
T	T	P	P	T	T	P	PPP
T	T	P	PPP	P	P	PPP	PPPP
T	P	PPP	PPP	T	P	PPP	PPPP
T	A	P	PPP	P	P	PPP	PPPP
A	T	P	PPP	T	T	P	PPP
T	T	P	PPP	A	A	P	P
T	T	PPP	PPPP				
TURLOCK (1916) (MELONS STORED).							
A	T	P	PPP	T	T	P	P
	T	P	P	T	T	P	P
T	T	P	P	A	T	P	P
	T	T	P	T	T	P	P
A	T	PPP	PPP	A	A	PPP	PPP
T	T	P	PPP				
BRAWLEY (1917) (MELONS NOT STORED).							
	T	PPP			T	PP	
	T	PPP			A	PPP	
	T	PP			A	PPP	
	A	PP			A	PP	
	A	PP			T	PP	
	T	P			T	PP	
	A	P			P	PPP	
	T	P			A	PPP	
	A	PPP			T	PP	
	T	P			T	PP	
	A	P			A	PP	
	T	PP			T	PP	
	A	PP			T	PP	
	T	PPP			A	PPP	
	T	PP			A	PP	
	A	PPP			PP	PP	
	A	PPP				PP	
	T	PPP				PPP	
	A	P				PPP	
	T	PP				PP	
	T	PPP				PPP	
	T	PP				A	
	A	PP				PPP	
BRAWLEY (1917) (MELONS STORED).							
	A	A			A	T	
	A	A			A	A	
	A	T			A		
	A	A					

[1] A, starch absent; T, trace of starch; P, starch present.

The disappearance of starch from the seeds seems to be an indication of maturity. Table 4 also shows that half-slip melons with high refractive indexes usually have little or no starch, and that even field-ripe melons with low refractive indexes tend to show starch in seeds. The correlation between maturity as judged by the refractive index and the starch in the seeds, however, is not so absolute as to extend to every melon. Exceptions to the rule in Table 4 are melons 12, 19, 20, 21, and 25, among the field-ripe lots, and melons 18 and 24, among the full-slip lots.

While only small differences in specific gravity and sugar between the full-slip and half-slip melons are shown (Tables 2 and 3), distinct differences are apparent when dependence is placed merely upon the depth of color developed by the starch-iodide test (Table 5). Such color tests, however, leave much to the judgment of the person making the test, and it was desired to measure the starch in the seeds quantitatively to fix a numerical standard. It was difficult to do this because of the small quantity of starch in the seeds. Most of the samples contained less than 1 per cent of starch and none of them had as much as 2 per cent.

The quantitative measurements of the starch content are shown in Tables 6 and 7. For comparison with the percentage of starch, the eating quality and the stage of development of each sample, as measured by different chemical standards, are shown. The dividing line appears to be at about 0.5 per cent. Melons with less than 0.5 per cent of starch in the seeds are of satisfactory quality, while those with larger quantities are questionable or unsatisfactory and probably immature. This statement applies to the unstored samples only. The starch content of the stored samples is discussed on page 22.

TABLE 6.—*Relation of starch content of seeds to stage of development (Brawley and Turlock, 1916).*

Lot No.	Stage of development.[1]	Solids soluble in juice.	Sucrose.	Starch in seeds.	Lot No.	Stage of development.[1]	Solids soluble in juice.	Sucrose	Starch in seeds.
Not stored:		*Per cent.*	*Per cent.*	*Per cent.*	Not stored—contd.		*Per cent.*	*Per cent.*	*Per cent.*
8	FS	13.1	5.84	0.10	285	HS	8.5	1.64	1.10
9	HS	12.6	5.37	.30	293	HS	8.5	1.05	.50
14	HS	13.8	6.57	.20	Stored:				
15	Im	10.7	3.82	.90	286	FS	11.4	5.72	.10
16	FS	13.5	6.49	.15	295	FS	11.9	5.84	.10
19	FS	14.0	8.06	None.	289	HS—Im	9.5	2.83	.55
20	HS	12.8	6.41	.35	297	HS—Im	9.0	2.37	.20
278	FS	12.4	5.18	.20					
281	HS—Im	8.8	1.94	.75					

[1] FS, full slip; HS, half slip; Im, immature.

TABLE 7.—*Relation of starch content of seeds to eating quality (Porterville and Turlock, 1920).*

Lot No.	Eating quality.[1]	Refractive index.	Sucrose.	Starch in seeds.	Lot No.	Eating quality.[1]	Refractive index.	Sucrose.	Starch in seeds.
Not stored:			*Per cent.*	*Per cent.*	Not stored—contd.			*Per cent.*	*Per cent.*
413 B	S	59.7	5.50	0.35	430 CE	P	44.0		1.50
413 A	Q	50.5	2.73	.55	435 A	S	58.8		.20
414	P	45.8	2.12	.60	435 DF	Q	49.2		.65
416 A	G	66.5	7.59	.00	435EGH	P	42.0		1.80
416 B	G	64.5	7.28	.15	Stored:				
416 C	G	61.1	5.93	.40	406 A	G	63.9		Trace.
416 D	Q	55.2	4.66	.95	406 BE	G	56.2		.20
416 E	P	44.4	1.94	1.15	406CDG	P	51.9		.20
426 B	S	65.2	7.20	.25	406 FH	P	45.9		.40
426 C	S	53.0	3.90	.60	415ABC	G	62.7		Trace.
426 A	P	50.5	2.55	.70	415 FH	P	45.0		.35
426 D	P	45.2	1.98	1.20	417ABD	S	61.1		.20
429 E	S	62.5		.30	417 CF	Q	56.9		.45
429 C	S	52.3		.40	417EGH	P	40.2		.30
429 H	P	48.0		1.20	452 B	G			.10
430 AB	S	61.0		.20	450	P			Trace.
430 D	G	54.8		.60					

[1] G, good; S, satisfactory; Q, questionable; P, poor.

SPECIFIC GRAVITY AND TOTAL SUGAR CONTENT.

The specific gravity of the whole melon, the specific gravity of the flesh of the melon, and the percentage of total sugar in the juice were also measured. With one exception, the values in all three cases increased with maturity. No correlation between the specific gravity of the seeds and maturity was noted.

The Brawley melons in 1920 showed an increase in specific gravity of flesh from 0.970 to 1.006, and the Porterville, 1920, one of from 0.944 to 0.991.

The juice of immature melons contained about 7 per cent of total sugar; that of full-slip melons, about 9 per cent. It did not seem desirable to use these constituents as a measure of maturity. The changes involved are not large, and the methods of measuring them are not convenient.

RELATION OF EATING QUALITY TO COMPOSITION.

It has been shown that the maturity of melons may be judged by the specific gravity of the juice, by its refractive index, by the percentage of sucrose it contains, and by the starch content of the seeds. It is, however, necessary to know in each case the approximate limit of value below which melons might be regarded as immature for commercial marketing. For this purpose, melons were cut and examined individually; or, if groups were made, they were based not on the slip of the melons but on the eating quality. Notes on the color, odor, and flavor of the flesh were made, or a general statement as to marketability was recorded. Judgment in such matters is subject to error, but in most cases a decision was reached by the agreement of two or more workers. The sample was then analyzed. The relation of the chemical characteristics of the juice to the eating quality, as judged in this manner, is shown in Table 8.

TABLE 8.—*Relation of eating quality to composition.*

TULARE COUNTY, 1920.

High quality.			Satisfactory.			Doubtful.			Not marketable.		
Refractive index of juice.	Brix.	Sucrose.	Refractive index of juice.	Brix.	Sucrose.	Refractive index of juice.	Brix.	Sucrose.	Refractive index of juice.	Brix.	Sucrose.
		Per cent.			*Per cent.*			*Per cent.*			*Per cent.*
53.8	10.9	4.60	68.6	14.2	7.94	66.6	13.8	7.54	42.7	-------	2.52
61.0	13.1	6.66	64.7	13.5	6.50	53.4	11.2	3.49	36.3	6.6	.29
60.6	12.8	5.90	58.6	11.6	6.04	45.6	9.2	2.52	45.3	9.0	2.34
66.0	12.6	7.03	56.9	11.6	5.46	51.2	10.0	3.31	33.3	6.8	.00
62.1	11.4	6.87	57.7	11.4	4.49	54.6	10.0	3.60	46.7	8.5	2.02
62.0	11.9	5.94	55.6	10.4	4.45	53.3	9.5	4.94	45.7	7.1	.70
67.0	12.8	7.67	59.1	11.6	6.06	51.9	9.0	3.97	45.3	8.8	1.88
65.9	11.9	7.18	60.7	11.4	5.85	63.0	12.4	6.48	44.7	8.8	1.78
60.5	11.2	6.47	58.9	10.9	5.20	54.5	10.0	3.51	43.2	7.5	.95
66.2	11.9	6.95	53.1	9.5	3.86	50.4	8.8	3.83	56.0	10.2	4.51
63.0	11.9	6.17	64.5	12.1	7.18	47.1	8.8	2.43	36.2	5.1	-------
63.6	12.4	6.80	60.3	11.4	6.47	48.3	8.8	2.41	44.6	7.5	2.00
66.4	12.8	7.24	64.0	12.1	7.26	53.3	9.2	3.29	47.7	8.3	1.96
65.4	11.9	7.31	68.3	12.6	8.18	62.3	11.2	6.05	54.0	9.5	4.29
61.0	11.9	6.27	62.9	11.4	6.90	53.1	9.2	3.67	52.3	9.5	3.12
67.0	12.8	7.38	60.3	10.9	6.43	52.8	9.2	3.83	45.6	7.1	1.63
60.0	10.4	5.47	64.0	11.6	7.00	51.5	8.8	3.12	52.5	8.8	3.43
-------	-------	-------	57.5	10.4	4.69	64.0	11.9	6.50	50.4	8.0	2.41
-------	-------	-------	60.3	11.9	5.41	50.4	9.5	3.42	49.2	8.8	2.44
-------	-------	-------	57.0	11.2	4.01	56.2	10.7	4.77	50.7	9.2	2.92
-------	-------	-------	57.0	10.4	4.23	50.1	8.8	-------	45.8	7.3	1.69
-------	-------	-------	54.0	9.5	4.28	-------	-------	-------	46.4	7.5	2.67
-------	-------	-------	57.9	10.4	5.39	-------	-------	-------	37.0	5.6	.40
-------	-------	-------	60.2	11.2	5.61	-------	-------	-------	41.6	6.8	1.04
-------	-------	-------	55.5	10.4	4.06	-------	-------	-------	44.4	7.1	1.94
-------	-------	-------	53.4	9.5	3.75	-------	-------	-------	-------	-------	-------
-------	-------	-------	53.3	9.5	4.67	-------	-------	-------	-------	-------	-------
-------	-------	-------	57.0	10.4	4.35	-------	-------	-------	-------	-------	-------
-------	-------	-------	53.8	10.0	3.77	-------	-------	-------	-------	-------	-------
-------	-------	-------	59.9	10.4	5.49	-------	-------	-------	-------	-------	-------
-------	-------	-------	47.9	8.5	2.56	-------	-------	-------	-------	-------	-------
-------	-------	-------	53.3	9.5	3.36	-------	-------	-------	-------	-------	-------
-------	-------	-------	55.0	10.0	3.75	-------	-------	-------	-------	-------	-------
63.0	**12.0**	**6.58**	**58.5**	**11.0**	**5.29**	**54.0**	**10.0**	**4.13**	**45.5**	**7.9**	**2.04**

TURLOCK, 1920.

54.4	10.7	-------	61.2	11.9	6.49	42.0	7.1	-------	47.0	8.0	-------
69.4	13.5	7.78	51.4	9.5	3.55	55.3	10.7	-------	46.0	8.0	-------
64.4	12.4	-------	46.2	8.0	-------	53.8	10.4	4.46	46.4	8.3	1.67
52.6	9.7	-------	65.8	12.4	-------	52.2	10.0	2.67	39.2	6.6	.70
-------	-------	-------	63.0	11.9	7.00	50.4	9.5	-------	46.9	8.0	1.89
-------	-------	-------	63.0	11.9	-------	52.3	9.7	-------	42.0	7.1	-------
-------	-------	-------	56.7	10.4	-------	48.9	8.3	-------	51.3	9.2	-------
59.8	10.9	-------	59.5	11.2	5.82	53.4	9.5	4.13	50.2	9.2	-------
61.3	11.9	-------	52.8	10.0	3.25	50.8	9.0	-------	45.0	7.5	-------
60.5	11.4	5.75	61.5	11.6	-------	49.5	8.5	-------	42.2	7.1	-------
62.8	12.4	-------	58.5	10.9	5.41	53.5	10.4	3.79	55.4	10.4	3.80
61.5	11.9	-------	56.5	11.4	4.50	54.2	10.4	-------	39.8	6.6	.90
61.7	11.6	-------	65.2	12.8	7.20	-------	-------	-------	50.5	9.5	2.55
61.6	11.4	-------	53.0	10.4	3.90	46.0	8.3	-------	45.2	8.3	1.98
63.0	11.9	-------	-------	-------	-------	42.3	7.1	-------	49.2	9.0	-------
60.7	10.9	-------	56.2	11.2	-------	42.8	7.1	-------	45.0	7.8	-------
62.4	11.6	-------	58.9	12.1	5.45	45.6	8.0	1.99	43.4	7.1	1.86
63.9	12.4	-------	56.5	11.4	5.01	51.0	9.5	-------	42.6	7.1	-------
62.8	12.8	-------	63.6	12.4	5.59	52.8	10.0	-------	48.0	8.0	-------
50.9	9.0	4.48	55.5	10.0	-------	46.8	8.5	-------	34.6	5.3	.30
62.7	12.4	7.06	56.4	10.7	-------	49.2	9.0	2.90	35.2	5.1	-------
63.8	12.4	6.44	63.4	11.9	-------	51.5	9.5	4.06	46.0	7.8	-------
62.0	11.9	-------	65.3	11.9	-------	41.3	7.1	-------	42.0	7.1	-------
58.5	11.2	-------	55.5	10.7	-------	46.5	8.8	-------	50.5	8.8	-------
61.0	11.4	-------	62.5	12.1	-------	54.2	9.5	-------	54.7	10.9	-------
61.5	11.9	-------	52.3	9.5	-------	51.0	9.5	-------	41.6	6.6	-------
56.0	10.9	5.14	59.2	11.4	5.67	56.6	10.7	-------	36.4	5.1	-------
55.3	10.9	4.69	62.0	11.9	-------	40.8	6.6	-------	44.0	7.5	-------
62.6	12.6	-------	67.2	12.8	-------	49.7	8.5	-------	41.9	6.6	-------
54.8	10.9	-------	50.5	9.5	3.70	51.4	9.5	-------	44.8	7.8	-------
-------	-------	-------	51.5	9.5	-------	50.4	8.8	-------	45.3	7.8	-------
-------	-------	-------	59.4	12.1	-------	50.3	9.0	-------	44.0	7.5	2.04

TABLE 8.—*Relation of eating quality to composition*—Continued.

TURLOCK, 1920—Continued.

High quality.			Satisfactory.			Doubtful.			Not marketable.		
Refractive index of juice.	Brix.	Sucrose.	Refractive index of juice.	Brix.	Sucrose.	Refractive index of juice.	Brix.	Sucrose.	Refractive index of juice.	Brix.	Sucrose.
		Per cent.			*Per cent.*			*Per cent.*			*Per cent.*
			54.4	9.7		50.0	8.8		53.5	9.5	
						52.6	9.7		41.3	7.1	
			56.8	10.0		56.8	10.7				
63.9	12.8		56.7	10.4		49.0	8.8				
59.2	11.4		58.5	11.4		53.2	10.0	4.42			
62.3	12.4		56.9	10.9							
60.0	11.4	7.28	51.4	8.8							
57.2	11.2	6.43	52.0	9.7							
			57.0	11.4							
			60.5	11.9							
			61.7	11.6	7.51						
			55.0	10.4	6.22						
			58.4	10.4							
			56.3	11.2							
			54.7	10.0							
60.5	**11.6**	**6.12**	**57.8**	**11.0**	**5.39**	**49.9**	**9.1**	**3.55**	**45.0**	**7.7**	**1.77**

BRAWLEY, 1921.

56.0	11.4		56.0	11.4		46.0	8.7		42.0	7.8	
63.0	12.9		55.0	11.2		52.0	10.5		36.0	6.2	
70.0	14.2		58.0	11.6		52.0	10.8		38.0	7.3	
65.0	13.3		60.0	12.3		51.0	10.0		45.0	8.8	
62.0	13.1		62.0	12.5		47.0	9.2		43.0	8.4	
58.0	12.0		63.0	12.7		50.2	10.1		42.0	8.1	
57.0	11.7		59.0	11.8		52.0	10.3		52.0	10.6	
59.0	12.7		59.0	12.0		53.0	10.9		35.0	6.4	
60.0	12.3		56.0	11.2		51.0	10.1		51.0	10.0	
55.0	11.2		59.0	11.9		52.0	10.4		37.0	6.8	
57.0	11.6					52.0	10.3		45.0	8.6	
62.0	12.5					46.0	8.6		47.0	9.1	
60.0	12.2					52.0	10.2		42.5	8.0	
60.0	12.0					55.0	11.1		47.0	9.4	
58.0	11.9					47.0	9.4		42.0	7.8	
60.0	13.2					53.0	10.5		50.0	9.6	
61.0	12.4								46.0	8.7	
62.5	12.8								47.0	9.0	
59.0	11.8								59.0	12.0	
56.0	11.1								48.0	9.2	
60.0	11.9								43.0	7.8	
61.0	12.4										
60.0	**12.3**		**58.7**	**11.9**		**50.7**	**10.1**		**44.6**	**8.6**	

TULARE COUNTY, 1921.

55.5	11.2		59.4	11.8		52.0	9.7		49.0	9.3	
52.8	10.0		64.3	13.1		48.3	9.2		43.0	7.7	
59.8	12.0		58.0			50.0	9.6		48.0	8.5	
59.9	12.0		55.0	11.2		48.0	8.8		48.0	9.6	
55.0	11.4		56.0	11.4		54.5	10.8		48.0	9.1	
55.0	11.0		56.0	11.4		49.5	10.0		42.0	8.2	
59.0	11.7		55.0	11.6		51.5	9.9		40.0	7.3	
66.0	13.5		57.0	11.6		49.0	9.1		46.0	9.0	
			54.0	11.0		57.5	11.7		47.0	9.0	
			62.5	12.7		57.8	11.4		44.0	8.6	
			63.0	13.1		51.0	10.4		51.0	9.9	
			56.5	11.6		51.5	10.3		46.0	9.0	
						57.0	11.6		45.5	8.5	
			57.0	11.5		51.0	10.2		44.0	8.2	
						51.5	10.1		45.0	8.0	
						52.0	10.5		44.0	8.5	
57.9	**11.6**		**57.9**	**11.9**		**52.0**	**10.2**		**45.7**	**8.7**	

TABLE 8.—*Relation of eating quality to composition*—Continued.

TURLOCK, 1921.

High quality.			Satisfactory.			Doubtful.			Not marketable.		
Refractive index of juice.	Brix.	Sucrose.	Refractive index of juice.	Brix.	Sucrose.	Refractive index of juice.	Brix.	Sucrose.	Refractive index of juice.	Brix.	Sucrose.
		Per cent.			*Per cent.*			*Per cent.*			*Per cent.*
65.0	13.2		55.5	11.1		52.0	10.1		47.0	8.8	
60.0	12.0		61.5	12.4		56.0	11.1		40.0	7.0	
60.0	12.3		61.0	12.5		58.0	11.6		42.0	7.3	
65.0	13.3		56.0	11.4		53.0	10.6		44.0	8.3	
62.0	12.4		60.0	12.3		48.0	9.2		43.0	8.0	
60.0	12.1		59.0	12.1		51.5	10.0		44.0	8.1	
56.0	11.1		58.0	11.6		52.0	10.2		39.0	6.5	
66.0	13.4		62.0	12.7		52.0	10.1		40.0	7.0	
			64.0	12.8		56.0	11.0		39.0	6.7	
65.5	13.2		62.0	12.8		50.0	9.8		41.0	7.3	
59.5	12.0		64.0	13.0		55.0	11.0		43.5	8.1	
60.5	12.0		61.5	11.9		51.0	9.9		42.5	8.0	
61.0	12.3		54.5	10.9		47.0	8.6		45.0	7.8	
			63.5	12.9		52.0	10.4		37.8	6.4	
			59.0	11.7		50.5	9.6				
			63.0	12.8		52.0	9.7				
			62.0	12.5		47.7	9.2				
						51.0	9.9				
						54.7	10.2				
						52.0	10.1				
						50.0	9.5				
61.7	**12.4**		**60.4**	**12.2**		**52.0**	**10.0**		**42.0**	**7.5**	

As the eating quality of the melon improved, the specific gravity and refractive index of its juice and the sucrose content increased.

The refractive index of the juice varied from 33.3 to 70 on the immersion refractometer scale. Out of 91 samples of melons listed as high in quality, 62 had an index of 60 or more, and none had one less than 50.9. Of the samples listed as satisfactory in quality, 83 per cent had an index of 55 or more. Greater variability is shown in the samples listed as doubtful, of which 85 per cent were below 55 and 71 per cent above 50. The indexes of melons listed as not marketable were very low, 92 out of 110 samples being below 50, and about half of them having values below 45.

A similar condition exists with respect to the percentage of sucrose. Immature melons showed low values and high-quality melons showed high values. All except three of the high-quality samples had a sucrose content in excess of 5 per cent. Only four of the doubtful group had one as high, and 85 per cent of those in the not-marketable class had sucrose contents below 3 per cent. More than 85 per cent of the samples of high or satisfactory quality had more than 4 per cent of sucrose, while more than 80 per cent of those in the doubtful or not-marketable classes had lower sucrose contents.

The difference in the soluble solids of the juice, while less striking, was distinct. Such differences can easily be measured with a Brix spindle, a reading of 11.2 being equivalent to a specific gravity of about 1.045, whereas values corresponding to 10 and 8.8 are 1.040 and 1.035, respectively. Readings on the Brix spindle, which can be readily made to 0.1, indicate the percentage of solids in solution in the juice. In this test poor-quality melons had low solids contents and good-quality melons had high solids contents. Of the

high-quality samples, 84 per cent contained 11.2 per cent solids or more, while of the not-marketable samples more than 75 per cent contained 8.8 per cent solids or less. From a total of 208 samples listed as either high or satisfactory in quality, 192, or 92 per cent, contained 10 per cent or over, while 73 per cent of the doubtful and not-marketable melons fell below 10 per cent.

From the data given in Table 8, the following limits are suggested as a basis upon which maturity and market quality may be judged. Melons having juice with a refractive index of 55 or more, with a sucrose content of 4.5 per cent or more, and with a Brix spindle reading of 10 (corrected for temperature) may be considered to be of marketable quality. In almost every case such melons would be satisfactory. Melons with juice having a refractive index below 50, a sucrose content below 3.5 per cent, and a Brix reading of 9 or less may be considered unsuitable for marketing. Melons with juice having values between these limits may be considered to be of doubtful quality. Too large a proportion of such melons in a shipment should be avoided.

The values suggested applied equally well to melons harvested in 1920 and 1921 at Brawley, Porterville, and Turlock.

RELATION OF EXTERNAL CHARACTERISTICS TO MATURITY.

In order to obtain information on the correlation between external appearance and maturity, melons were examined individually and notes were made on certain external characteristics. The refractive index of the juice of each melon was then determined and used as an index of maturity, high values indicating maturity and low values immaturity. The results are given in Table 9.

TABLE 9.—*Refractive index of juice of melons having various external characteristics.*

Color of melon.			Color of stem at base.		Color of ground spot.		Water line on netting.		
Dark green.	Medium green.	Light green or yellowish.	Green.	Waxy.	Green or greenish.	White or yellow.	Distinct.	Medium.	None or faint.
58.7	57.8	53.8	58.4	57.8	58.4	58.7	58.4	57.8	50.7
58.4	64.0	66.4	50.7	58.7	53.8	63.6	53.8	58.7	63.6
50.7	47.9	59.9	53.8	63.6	52.8	66.4	45.8	52.8	59.9
63.6	61.0	65.4	59.9	52.8	45.8	59.9	46.4	66.4	65.4
52.8	56.2	42.0	50.4	66.4	51.5	64.0	51.5	54.7	64.0
45.8	67.0	61.2	53.2	45.8	47.9	50.4	53.3	50.1	50.4
51.5	50.1	64.4	54.7	53.3	61.0	53.3	47.9	53.5	61.0
50.4	53.5	65.8	55.0	60.0	56.2	67.0	55.0	41.6	56.2
53.3	37.0	63.0	53.5	51.4	53.3	41.3	37.0	64.4	67.0
53.3	60.0	48.9	37.0	52.3	53.2	61.2	41.3	46.2	53.3
53.2	52.2	61.3	41.3	52.6	55.0	64.4	46.4	50.2	53.2
54.7	51.4	62.8	52.2	46.2	50.1	51.4	39.2	63.0	60.0
55.0	50.4	----------	50.4	53.5	53.5	65.8	42.0	56.7	42.0
41.6	52.3	----------	47.0	61.7	60.0	48.9	----------	59.5	55.3
47.0	52.6	----------	46.4	61.6	69.4	61.3	----------	49.5	54.4
63.0	46.2	----------	46.4	61.5	52.2	61.5	----------	46.4	61.2
53.4	46.4	----------	54.2	46.0	50.4	61.7	----------	47.0	69.4
50.8	61.5	----------	39.2	----------	52.3	52.8	----------	46.0	53.8
56.7	61.7	----------	52.8	----------	52.6	61.5	----------	45.0	52.2
59.5	50.2	----------	46.9	----------	46.2	63.0	----------	51.3	51.4
49.5	45.0	----------	51.3	----------	63.0	60.7	----------	46.9	50.4
46.4	63.0	----------	50.2	----------	63.0	62.4	----------	61.7	52.3
53.5	62.4	----------	----------	----------	53.4	----------	----------	61.5	65.8
54.2	58.5	----------	----------	----------	50.8	----------	----------	----------	48.9
60.5	----------	----------	----------	----------	46.0	----------	----------	----------	63.0
39.2	----------	----------	----------	----------	45.0	----------	----------	----------	58.5
46.0	----------	----------	----------	----------	59.5	----------	----------	----------	52.6
----------	----------	----------	----------	----------	49.5	----------	----------	----------	53.4
----------	----------	----------	----------	----------	46.4	----------	----------	----------	50.8
----------	----------	----------	----------	----------	54.2	----------	----------	----------	59.8
----------	----------	----------	----------	----------	60.5	----------	----------	----------	61.3
----------	----------	----------	----------	----------	61.6	----------	----------	----------	53.5
----------	----------	----------	----------	----------	----------	----------	----------	----------	54.2
----------	----------	----------	----------	----------	----------	----------	----------	----------	60.5
----------	----------	----------	----------	----------	----------	----------	----------	----------	62.8
----------	----------	----------	----------	----------	----------	----------	----------	----------	61.5
----------	----------	----------	----------	----------	----------	----------	----------	----------	52.8
----------	----------	----------	----------	----------	----------	----------	----------	----------	61.6
----------	----------	----------	----------	----------	----------	----------	----------	----------	63.0
----------	----------	----------	----------	----------	----------	----------	----------	----------	60.7
62.7	**54.5**	**59.6**	**50.2**	**55.6**	**54.0**	**59.1**	**47.5**	**53.5**	**57.3**

COLOR OF MELON.

The background color which shows through the openings between the lines of netting was noted. Dark-green melons were not as ripe as those having light-green or yellowish backgrounds. That melons could not be satisfactorily picked on this basis alone, however, is shown by the fact that about one-third of the dark-green melons had index values characteristic of mature melons of good quality, and more than half of them had indexes above 53. Melons could not be rejected merely because the background was dark green.

COLOR OF STEM BASE.

The stem near the place of attachment to the melon in some cases had a greenish tinge and in others a waxy color, resembling paraffin, often with a yellow line marking the boundary between stem and fruit.

Judging by the refractive index, the melons with waxy stems were riper than those with green stem bases. In 1918 and 1919, attempts were made to use this distinction as a picking standard by which satisfactory melons could be selected and unsatisfactory melons discarded. Although it failed of its purpose in this respect, seeds from melons with waxy stems gave a distinctly weaker starch test, showing they were more mature, and thus confirming the results in Table 9.

Even if this method gave dependable results, however, it probably could not be applied under field conditions. It would be impracticable for the picker to examine the melons closely enough to note this difference.

COLOR OF GROUND SPOT.

The relation between maturity, as judged by the refractive index, and the color of the spot on the melon where it rests upon the ground was determined. Melons with white or yellow ground spots were riper than those with greenish ground spots. There were many exceptions, however, fully half of the green-spot melons being mature and some of the yellow-spot melons immature. Furthermore, the method could not be used under field conditions.

WATER LINE ON NETTING.

A distinct crease, termed the water line, was found on top of the netting of some melons. This crease was indistinct or absent on the netting of other melons. The refractive indexes of melons classified on this basis were measured.

While a correlation between maturity and the appearance of this crease on the netting exists, at least one-fourth of the melons with faint water lines were probably not suitable for market, and about half of those listed as medium only in this respect were of good quality. The appearance of the water line on the netting would probably not be a dependable basis for judging maturity. It would be of some value, however, to an inspector in sorting out and eliminating immature melons at the packing bench.

SEPARATION OF HALF-SLIP MELONS INTO GROUPS BY EXTERNAL APPEARANCE.

The data in Table 4 show that half-slip melons form a variable group, containing both mature and immature fruit. Some are satisfactory in eating quality but others are so immature as to be entirely unfit for marketing.

It seemed desirable to determine whether it would be possible to separate half slips into groups by the external appearance. Half-slip melons were taken from commercially packed crates or from the general field run of melons. No effort was made to select specially good or poor melons for this purpose, but all half slips were taken without sorting and all melons thus selected were used. They were classified into two groups, satisfactory and unsatisfactory, mainly on the basis of the development of the netting—whether the netting was well raised and well rounded. The other characteristics noted in Table 9 were also taken into account. The melons were then marked with a blue pencil to indicate the class in which they had been placed. Some of them were cut at once and a decision was

made as to the eating quality of the flesh; others were stored in a refrigerator for from 10 to 12 days before being examined. The results showing the relation between external appearance and internal condition after cutting are given in Table 10.

A fairly satisfactory separation of the half-slip melons was accomplished by the appearance of the melon. Thus, out of a total of 1,089 melons in the group classed as satisfactory by appearance, 68 per cent were of good quality when the flesh was examined; while of those with unsatisfactory appearance, 26 per cent proved to have flesh of satisfactory flavor.

TABLE 10.—*Separation of half-slip melons into groups by external appearance.*

TULARE COUNTY AND TURLOCK, 1920.

Lot No.	Satisfactory appearance.				Unsatisfactory appearance.			
	Number examined.	Internal quality found—			Number examined.	Internal quality found—		
		Good.	Questionable.	Not edible.		Good.	Questionable.	Not edible.
Examined and analyzed at once:								
413	25	16	8	1	15	3	6	6
416	12	12	0	0	6	0	1	5
418	11	10	1	0	8	2	5	1
421	12	6	5	1	3	0	0	3
423	9	9	0	0	5	0	0	5
426	9	3	0	6	7	4	0	3
428	6	2	4	0	5	1	0	4
429	10	9	1	0	14	0	7	7
430	7	7	0	0	6	0	0	6
432	7	7	0	0	6	0	4	2
433	11	0	9	2	15	0	7	8
434	7	3	4	0	5	0	0	5
435	15	9	4	2	12	0	2	10
Total	141	93	36	12	107	10	32	65
Per cent		66	25.5	8.5		9.3	29.9	60.7
Examined, stored, and then analyzed:								
406	13	4	9	0	15	6	0	9
408	9	9	0	0	10	4	0	6
409	11	7	4	0	9	0	7	2
415	14	11	3	0	6	0	2	4
417	18	18	0	0	13	4	0	9
420	11	11	0	0	22	0	12	10
422	24	17	7	0	8	0	5	3
425	15	15	0	0	17	0	10	7
451	14	9	5	0				
Total	129	101	28	0	100	14	36	50
Per cent		78.3	21.7	0		14	36	50

TABLE 10.—*Separation of half-slip melons into groups by external appearance*—Contd.

BRAWLEY, TURLOCK, AND TULARE COUNTY, 1921.

Lot No.	Satisfactory appearance.				Unsatisfactory appearance.			
	Number examined.	Internal quality found—			Number examined.	Internal quality found—		
		Good.	Questionable.	Not edible.		Good.	Questionable.	Not edible.
Examined and analyzed at once:								
469-73	16	10	0	6	9	1	0	8
478-82	14	7	0	7	9	1	4	4
486-89	16	9	0	7	10	0	9	1
492-96	15	7	5	3	10	0	9	1
499-504	29	16	0	13	10	4	3	3
505-10	23	11	7	5	22	11	5	6
511-18	17	10	0	7	28	5	9	14
519-22	16	16	0	0	22	9	0	13
523-26	20	20	0	0	24	10	7	7
527-31	25	25	0	0	21	8	6	7
532-36	25	23	0	2	21	11	7	3
537-39	22	22	0	0	23	10	13	0
540-43	25	21	0	4	20	9	11	0
544-46	23	23	0	0	11	0	7	4
547-55	10	5	0	5	35	3	16	16
556-57	15	0	10	5				
559-62	8	4	4	0	14	1	0	13
564-66	22	12	0	10	7	0	0	7
567-70	22	10	0	12	23	4	0	19
571-76	21	18	2	1	12	3	5	4
577-82	41	19	14	8	39	10	9	20
583-90	24	13	8	3	23	2	5	16
591-94	28	17	11	0	17	0	2	15
595-601	27	21	5	1	22	7	6	9
604-05	30	27	3	0				
606-11	20	14	5	1	25	17	0	8
612-20	45	41	3	1	43	18	1	24
621-28	18	17	0	1	27	18	5	4
629-34	32	20	10	2	13	4	5	4
635-41	38	31	4	3	34	9	10	15
642-47	33	30	3	0	27	0	16	11
651-56	31	26	4	1	22	11	7	4
658-60	30	21	7	2				
662-64	37	20	0	17	5	0	0	5
665-67	40	8	16	16	4	0	1	3
668-70	39	16	9	14	6	0	1	5
671-73	40	29	11	0	5	1	2	2
674-78	11	11	0	0	12	4	3	5
Total	948	650	141	157	655	191	184	280
Per cent		68.6	14.9	16.5		29.2	28.1	42.7

Much can be done by the shipper to eliminate immature melons, by impressing upon pickers the advisability of picking only melons with fully developed netting, leaving those with doubtful netting for a later picking, and by having at the packing bench inspectors whose duty it is to examine the melons as they are dumped from the field boxes into the packing bins, eliminating those having an external appearance which plainly indicates immaturity and inferior quality.

EFFECT OF STORAGE ON COMPOSITION.

An attempt was made to estimate the extent of some of the changes in composition which take place during storage. Storage conditions comparable with those to which the melons are subjected in commercial operations were sought. In Brawley and Turlock, in 1916 and 1917, melons were placed in iced refrigerator cars. At the same time a sample of six melons of the same class was taken and the analysis of this lot was used as a check upon the stored melons. At

the end of 10 days, 12 melons were removed, 6 of them being analyzed at once and the others allowed to stand for two days at room temperature before analysis. The object was to represent in a measure the conditions to which the melons are exposed at the retail store. The results are shown in Table 11.

TABLE 11.—*Effect of storage on composition of juice.*

TURLOCK, 1916.

Lot No.	Stage of maturity.[1]	Soluble solids in juice.			Sucrose.			Total sugar.		
		At time of storage.	Refrigerator, 10 days.	Refrigerator and storage.[2]	At time of storage.	Refrigerator, 10 days.	Refrigerator and storage.[2]	At time of storage.	Refrigerator, 10 days.	Refrigerator and storage.[2]
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
1	FR	13.1	12.4	12.4	6.22	6.26	6.20	9.40	8.88	8.90
2	FS	12.1	12.1	10.2	5.80	5.81	4.32	8.81	8.80	7.27
3	HS	12.4	12.1	10.7	5.22	5.18	4.23	8.67	8.68	7.76
4	Im	7.1	10.7	9.3	1.21	4.06	2.76	5.09	7.66	6.44
5	FS	12.1	12.6	10.5	4.82	6.23	4.34	7.97	8.65	7.06
6	HS	11.2	11.2	10.9	4.17	4.24	4.64	7.78	7.91	7.87
7	Im	10.5	11.2	8.3	3.40	4.48	1.42	7.27	7.85	5.88
8	FR	13.1	10.9	11.6	6.37	5.73	6.19	9.27	8.14	8.23
9	FS	13.1	13.1	12.6	6.47	6.58	6.57	9.51	9.30	9.11
10	HS	13.5	12.4	11.4	7.20	5.15	4.48	9.85	8.63	8.21
11	Im	11.4	9.3	10.9	4.47	2.08	4.82	8.51	6.49	7.72
12	FR	10.7	11.4	10.0	4.69	5.56	4.25	7.68	8.48	7.16
13	FS	11.4	11.9	10.5	5.21	5.41	4.57	8.25	8.31	7.50
14	HS	11.6	11.9	10.5	5.16	5.15	4.18	8.73	8.53	7.56
15	Im	9.7	11.2	10.0	3.12	4.12	2.83	7.15	8.31	7.04

BRAWLEY, 1916.

16	FS	13.5	13.3	----------	7.32	7.37	----------	9.82	9.43	----------
17	HS	12.6	12.8	----------	6.04	6.66	----------	8.92	9.01	----------
18	FR	14.0	11.4	----------	7.43	5.54	----------	9.85	7.70	----------
19	FS	13.1	13.3	----------	6.22	6.99	----------	9.46	9.33	----------
20	HS	12.1	10.9	----------	5.37	4.25	----------	8.58	7.74	----------
21	FS	13.5	12.6	12.4	6.98	6.81	6.14	9.69	8.80	8.45
22	HS	12.6	12.6	12.1	5.46	5.87	5.50	9.03	9.21	8.53
23	FS	13.1	11.9	11.6	6.52	5.03	5.80	9.17	8.32	8.28
24	HS	11.9	11.9	11.6	4.94	6.41	5.30	8.15	8.48	8.43

[1] FR, field ripe; FS, full slip; HS, half slip; Im, immature.
[2] Refrigerator, 10 days, and at room temperature, 2 days.

A sampling error is involved in these measurements and part of the change indicated is due to variation in the samples themselves. Six melons are not enough to represent the group.

Averages are not given, as it is believed that greater accuracy is reached by considering each lot separately. Thus lot 1 shows no change in composition during the storage period. Lot 2 shows a decrease in composition during the two days in common storage, but none during refrigerator storage. An actual increase is apparent in lot 4 during refrigerator storage, but this difference is no doubt due to the sampling error.

Comparing the sucrose values for the 10-day refrigerator storage lot with the check values, out of 24 determinations there were 15 increases and 9 decreases. This indicates no change, as the small increases may have been due to loss of water by evaporation.

A comparison of the sucrose values of the check samples with those of the samples stored in the refrigerator car and held for two days at room temperature shows 6 increases against 13 decreases. Taking into account the fact that any water loss by evaporation would cause

an increase because of a slight concentration of juice, these figures indicate that a decrease in sucrose occurred after the melons were removed from the refrigerator car, at the relatively high room temperature that prevailed at the time. It is believed, however, that this loss was not much greater than 1 per cent of sucrose.

Further evidence on the effect of storage on composition was found. Two crates of half-slip melons were gathered from the field at Brawley, expressed to Los Angeles, and placed in cold storage at a temperature of 3° C. At regular intervals samples were removed and analyzed, counting the time of storage from the date of arrival in Los Angeles. No significant changes were found during 10 or 12 days, any differences being within the sampling error. All these samples were analyzed immediately on removal from the refrigerator. The results, together with those in Table 11, support the conclusion that at such temperatures the changes in composition of the constituents measured are slight.

The effect of storage upon the composition of the juice of melons stored at Porterville and at Turlock in 1920 is shown in Table 12. Only full slips were used for the comparison, as they are more uniform in composition than other types.

The Porterville melons were stored in an ice house at temperatures from 2° to 5° C. for 10 days, after which they were shipped by express to Turlock for analysis. Usually less than 24 hours elapsed from the time of removal from the refrigerator until the time of analysis. The Turlock melons after storage in an ice house at from 2° to 5° C. for 10 days were shipped by express to Los Angeles, the transit period being about 48 hours. They were then held in cold storage from 4 to 5 days and analyzed.

During the analytical work, some of the melons were badly broken down; that is, the flesh became very soft and watery. In some cases a distinctly bad odor developed.

TABLE 12.—*Effect of storage on composition of juice.*

Full-slip melons.				Melons with flesh broken down.	
Not stored.		Stored.			
Refractive index.	Sucrose.	Refractive index.	Sucrose.	Refractive index.	Sucrose.
	Per cent.		*Per cent.*		*Per cent.*
65.4	7.31		7.49	54.3	
64.0	6.50	65.6		66.2	
61.2	6.49	62.8		67.2	7.00
69.4	7.78	67.2	7.00	54.2	
64.4		56.0	5.14	57.4	
65.8		62.7		59.2	5.67
61.3		63.9		62.2	
62.8		57.4		63.6	
62.4		60.9			
61.8		54.2		56.7	
65.3		60.0	7.28	61.3	
62.0		55.0	6.22	61.5	
59.4				51.3	
58.5				53.0	
60.5					
58.8					
62.7	**7.02**	**60.5**	**6.63**	**59.1**	**6.34**

Storage under such conditions caused a small loss in sucrose and a slight lowering of the refractive index (Table 12). The results in Table 11 indicate that these changes occurred largely while the melons were in transit.

If melons are kept at temperatures similar to those found in iced refrigerator cars from the time of picking, the composition of the juice changes little. Hence, the composition of a shipment at any time is indicative of its composition at the time of picking. When removed from storage and held at room temperature, the composition of the juice is changed somewhat. The loss in sucrose after two days, however, is slight.

EFFECT OF STORAGE ON STARCH CONTENT OF SEEDS.

The weaker starch-iodide tests on the seeds of stored melons (Table 5) indicated that a loss of starch occurs during storage. Quantitative measurements of this change are shown in Tables 6 and 7. For example, unstored melons with a refractive index below 50 or a sucrose content below 4 per cent generally showed a relatively high starch content, in every case 0.5 per cent or more and running as high as 1.8 per cent. Such large percentages of starch, however, were not found in the stored samples. Lots 406 FH and 417 EGH had refractive indexes of 45.9 and 40.2, associated with starch contents of 0.4 and 0.3 per cent.

Further evidence on this point was obtained from the experiments in 1919 on melons with green and waxy stems (p. 17). In this case, each of six lots of melons was divided into three groups, one sample being examined at once, one stored for from 10 to 12 days in a refrigerator at 11° to 16° C., and one left for 10 or 12 days at room temperature (85° to 90° F.). All the melons examined at the time of picking gave a distinct test for starch. Those removed from refrigerator storage showed the presence of starch, although the tests were weaker. All of the lots that had been stored at room temperature gave negative tests.

This would weigh against the use of the starch content of the seeds of stored melons as an indication of maturity, since the starch content of melons after a storage period would give no indication of the stage of development at the time of picking, and would not be correlated satisfactorily with eating quality.

Table 13 shows the composition of the Eden Gem and Early Water melons grown at Brawley in 1916. At the time it was not possible to foresee that these melons would not be raised during the following seasons, so that a few were included among the samples.

TABLE 13.—*Composition of miscellaneous samples.*

EDEN GEM MELONS (BRAWLEY).

Sample No.	Date picked.	Outside color.[1]	Rind.	Edible portion.	Contents of cavity.	Specific gravity of whole melon.	Juice.				Starch in seeds.[2]
							Solids.	Invert sugar.	Sucrose.	Total sugar.	
Ripe:	1916		*P. ct.*	*P. ct.*	*P. ct.*		*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	
54	June 5	Y	36	56	8	0.985	14.3	2.60	7.48	10.08	A.
93	June 12	Y	33	59	8	.959	12.0	3.05	5.94	8.99	A.
119	June 16	Y	39	54	7	.963	12.3	2.74	6.46	9.20	A.
Average			**36**	**56**	**8**	**.969**	**12.9**	**2.80**	**6.63**	**9.42**	
Full slip:											
13	May 26	Sl. Y	39	54	7	.955	14.3	3.02	7.15	10.17	D.
14	do	Lt. G	62	29	9	.914	10.1	3.68	3.39	7.07	P.
21	May 29	Sl. Y	40	53	7	.946	13.7	3.13	6.76	9.89	T.
22	do	Sl. Y	42	50	8	.958	14.1	3.41	6.87	10.28	A.
33	May 30	Y	45	48	7	.925	14.0	2.78	7.54	10.32	A.
43	June 2	Y	43	49	8	.939	13.2	2.79	6.03	8.82	A.
44	do	Sl. Y	50	43	7	.941	13.1	3.14	5.98	9.12	T.
55	June 5	Sl. Y	41	52	7	.939	13.9	3.00	7.00	10.00	A.
56	do	Sl. Y	46	46	8	.932	12.9	3.85	5.54	9.39	P.
66	June 7	Y	43	51	6	.951	13.2	3.17	6.18	9.35	A.
94	June 12	Y	39	53	8	.954	12.9	3.26			P.
120	June 16	Sl. Y	42	49	9	.967	11.1	2.86	5.11	7.97	T.
Average			**44**	**48**	**8**	**.943**	**13.0**	**3.17**	**6.14**	**9.31**	
Half slip:											
15	May 26	Lt. G	53	39	8	.922	9.8	3.53	3.27	6.80	P.
23	May 29	Lt. G	48	44	8	.936	13.9	3.12	6.65	9.77	P.
34	May 30	Sl. Y	46	44	10	.944	14.8	2.77	7.94	10.71	T.
45	June 2	Lt. G	48	44	8	.914	12.8	3.75	5.44	9.19	L.
57	June 5	Lt. G	51	40	9	.928	9.6	4.04	2.75	6.79	L.
67	June 7	Lt. G	53	49	8	.943	12.4	3.04	5.63	8.67	P.
95	June 12	Sl. Y	45	47	8	.945	12.2	3.87	5.04	8.91	L.
121	June 16	Lt. G	49	43	8	.927	11.7	3.50	5.10	8.60	L.
Average			**49**	**44**	**8**	**.932**	**12.1**	**3.45**	**5.23**	**8.68**	
Green:											
16	May 26	G	50	31	19	.938	6.7	3.98	0.00	3.98	P.
68	June 7	G	63	28	9	.936	11.2	4.10	4.17	8.27	L.
96	June 12	G	53	37	10	.949	8.2	4.10	1.75	5.85	L.
122	June 16	G	57	34	9	.938	9.9	3.92	3.77	7.69	L.
Average			**56**	**32**	**12**	**.940**	**9.0**	**4.03**	**2.42**	**6.45**	

EARLY WATER MELONS (BRAWLEY).

Ripe:											
4	May 26	Y	36	54	10	0.962	12.5	2.56	6.20	8.76	A.
17	May 29	Y	47	44	9	.937	14.0	2.60	7.41	10.01	A.
30	May 30	Y	46	45	9	.928	12.4	2.39	6.17	8.56	A.
35	June 2	Y	43	49	8	.931	13.5	2.67	6.98	9.65	A.
46	June 5	Y	39	51	10	.947	12.4	2.88	6.37	9.25	A.
58	June 7	Y	41	51	8	.936	12.8	3.00	6.31	9.31	A.
85	June 12	Y	45	46	9	.926	12.5	2.45	6.65	9.10	A.
107	June 15	Y	45	47	8	.932	13.1	2.45	7.29	9.74	A.
Average		Y	**43**	**48**	**9**	**.937**	**12.9**	**2.62**	**6.67**	**9.29**	
Full slip:											
5	May 26	Sl. Y	41	48	9	.947	14.0	2.90	7.35	10.25	A.
6	do	G	43	45	12	.919	13.3	3.11	6.41	9.52	T.
18	May 29	Sl. Y	48	44	8	.933	14.0	2.94	7.24	10.18	A.
19	do	G.Y.	50	42	8	.899	13.5	3.01	6.90	9.91	T.
29	May 30	Sl. Y	47	45	8	.941	13.3	2.83	6.68	9.51	A.
36	June 2	Lt. Y	48	44	8	.928	13.1	3.18	6.20	9.38	A.
37	do	G.Y.	55	35	10	.904	13.5	3.19	6.60	9.79	T.
47	June 5	Y	46	46	8	.919	13.6	2.85	7.15	10.00	A.
48	do	G.Y	45	47	8	.910	13.6	3.57	6.70	10.27	A.
59	June 7	G.Y	45	47	8	.923	12.7	2.80	6.20	9.00	T.
86	June 12	G.Y	52	39	9	.924	13.0	2.45	6.90	9.35	D.
108	June 15	Sl. Y	51	41	8	.912	12.5	2.66	6.53	9.19	A.
Average			**48**	**44**	**9**	**.922**	**13.3**	**2.96**	**6.74**	**9.70**	

[1] Y, yellow; G, green; Sl, slightly; Lt, light.
[2] A, absent; D, doubtful; T, trace; P, present; L, large quantity.

TABLE 13.—*Composition of miscellaneous samples*—Continued.

EARLY WATER MELONS (BRAWLEY)—Continued.

Sample No.	Date picked.	Outside color.	Rind.	Edible portion.	Contents of cavity.	Specific gravity of whole melon.	Juice.				Starch in seeds.
							Solids.	Invert sugar.	Sucrose.	Total sugar.	
Half slip:	1916		*P. ct.*	*P. ct.*	*P. ct.*		*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	
7	May 26	G	63	27	10	.904					P.
20	May 29	Lt. G	55	35	10	.910	13.8	3.27	7.09	10.36	P.
38	June 2	Lt. G	58	33	9	.918	13.3	3.56	6.02	9.58	P.
49	June 5	G.Y	50	42	8	.901	14.0	3.55	6.36	9.91	A.
60	June 7	Lt. G	48	43	9	.910	12.6	3.04	6.01	9.05	P.
87	June 12	Lt. G	54	37	9	.907	12.0	3.05	5.60	8.65	P.
109	June 15	Lt. G	56	35	9	.922	12.0	2.93	5.63	8.56	P.
Average			**55**	**36**	**9**	**.910**	**12.9**	**3.23**	**6.12**	**9.35**	
Green:											
8	May 26	G	70	18	12	.909	10.1	4.56	1.33	5.89	P.
61	June 7	G	65	25	10	.903	9.3	4.19	2.50	6.69	L.
88	June 12	G	53	38	9	.893	10.8	3.50	4.17	7.67	L.
100	June 13	Lt. G.–G.	52	39	9	.916	11.7	3.26	5.07	8.33	L.
110	June 15	G	60	31	9	.892	10.8	3.76	3.99	7.75	L.
Average			**60**	**30**	**10**	**.903**	**10.5**	**3.85**	**3.41**	**7.26**	

TABLE 14.—*Composition of Honeydew melons.*

Sample No.	Date picked.	Date analyzed.	Quality.[1]	Rind.	Edible portion.	Contents of cavity.	Juice.					Starch in seeds.
							Solids.	Invert sugar.	Sucrose.	Total sugar.	Refractive index.	
Not stored:				*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*		
Brawley—	1916											
173	June 26		S	28	68	4	12.35	3.15	6.34	9.49		None.
Turlock—												
269	Aug. 15		S	33	63	4	13.86	4.08	6.45	10.33		Slight trace.
	1920											
424	July 30		S				12.40		5.55		62.0	
436	Aug. 4		S				12.57		5.91		62.4	
443 AA	Aug. 6		S				12.27		5.54		61.9	
443 B	do		S				12.27		6.34		61.0	
443 C	do		S				11.82		6.50		59.7	
443 D	do		S				12.09		6.22		60.7	
443 E	do		Q				10.08		3.83		52.2	
443 F	do		Q				10.15		5.10		52.2	
444 A	do		Q				11.83		4.52		58.9	
444 B	do		S				12.44		4.52		60.9	
444 C	do		S				12.74		5.34		62.1	
444 D	do		Q				10.11		3.28		53.8	
444 E	do		S				13.27		5.88		64.4	
444 F	do		S				14.04		7.00		68.4	
445 A	do		Im				6.96		1.04		40.4	
445 B	do		Im				5.81		0.32		35.0	
445 C	do		Im				5.31				33.0	

[1] S, satisfactory; Q, questionable; Im, immature; A, abnormal.

TABLE 14.—*Composition of Honeydew melons*—Continued.

Sample No.	Date picked.	Date analyzed.	Quality.	Rind.	Edible portion.	Contents of cavity.	Juice.					Starch in seeds.
							Solids.	Invert sugar.	Sucrose.	Total sugar.	Refractive index.	
				Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	
Stored melons: 298 [2]	1916 Aug. 15	1916 Aug. 23	S	21	74	5	13.35	3.10	6.59	9.69		None.
447 A	1920 Aug. 6	1920 Aug. 19	S				14.54		7.33		70.7	
447 B	do	do	S				14.42		7.79		69.3	
447 C	do	do	S				12.41		6.77		60.7	
447 D	do	do	S				13.71		7.44		67.1	
447 E	do	do	S				13.31		5.90		65.0	
448 A	do	do	S				11.17		4.04		55.6	
448 B	do	do	Im				9.08		1.09		47.1	
448 C	do	do	S				11.91		5.13		58.5	
448 D	do	do	S				11.62		3.80		57.5	
448 E	do	do	S				13.49		7.25		65.6	
448 F	do	do	S				13.38		6.67		64.6	
449 A	do	do	S				11.58				57.0	
449 B	do	do	Im				4.94				31.2	
449 C	do	do	A				8.34				46.7	
449 D	do	do	Q				10.57		4.95		52.2	
449 E	do	do	Q				10.97				54.8	
449 F	do	do	Im				6.42		2.29		40.0	

[2] Same lot as Sample 269.

PRACTICAL APPLICATION OF RESULTS.

Part of the work done in 1921 dealt with the practical application to field conditions of tests already developed. Some difficulties were encountered. Such difficulties, however, may be overcome by giving individual attention to each field of melons.

The fact that the outside appearance of melons does not always correlate to the same degree with the condition inside can not be denied. Final judgment as to the degree of maturity of melons in any field should be made only after the field has been thoroughly sampled and the samples cut and tested; nor should the sampling be stopped after the pickers are turned into the patch. Every intelligent field overseer realizes that at the first picking the standard set must be very closely adhered to if the picking of many green melons is to be avoided. Indeed, as far as maturity is concerned, it would seem best to permit a few melons to become field ripe before the regular picking crews start picking. In this way the quantity of well-netted melons found will be much greater than when these melons are picked as soon as the netting appears and the pickers will not have to overstep the standard in order to secure a satisfactory number. No matter how closely the standard of picking is set, the line is usually overstepped if there are but few standard melons. Invariably poor selection results unless there are a few field-ripe melons to be seen.

Under present conditions of growing and picking cantaloupes in California, a perfect pack is out of the question. Improvement, however, is possible by exercising intelligent control of the pickers and making a more rigid inspection at the packing sheds. In too many cases the final selection at the packing shed is left to the packers, and there is no one whose sole duty it is to sort out the obviously

green fruit. Packers are more interested in the size and shape of melons than in their maturity.

The need for greater care in selecting sufficiently ripe melons for shipment is shown by the fact that in an examination of 22 crates of melons commercially packed and ready for shipment during the 1921 season, only two contained 80 per cent of satisfactory melons. Of these two, one contained 18 per cent of melons too green for shipment. Four crates contained less than 33 per cent of satisfactory melons, and seven contained over 33 per cent of melons unfit for shipment. The average percentage of satisfactory melons was 60, that of doubtful melons 15, and that of green melons 25. These crates were in no way specially selected. They were average, every-day shipments from all the districts of the State.

SUMMARY.

The soluble solids content, the refractive index, and the sucrose content of the juice of cantaloupes increase and the percentage of starch in the seeds decreases as the melons ripen.

The juice of melons which are mature when picked has a specific gravity of at least 1.040, equivalent to 10 per cent solids, a refractive index of at least 55 on the immersion refractometer, and a sucrose content not less than 4.5 per cent. The seeds of such melons contain less than 0.5 per cent of starch.

Melons gain in flavor, but not in sweetness, after being picked. On storage at low temperatures, such as are found in iced cars, the melons change but little, so that their composition during and immediately after storage indicates their condition when picked. After softening, if kept at ordinary temperatures there is a slight loss in sucrose. After picking and storage, there is a loss of starch in the seeds.

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27

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